

TITLE

MOTORCYCLE AND SMALL VEHICLE LIFT

CROSS-REFERENCE TO RELATED APPLICATION

5 This application is a continuation-in-part of the co-pending U.S. patent application serial no. 10/187,376 filed July 1, 2002.

BACKGROUND OF THE INVENTION

 The present invention relates generally to an apparatus for lifting small vehicles such as
10 motorcycles for maintenance and storage purposes.

 There are many different prior art lifts designed for use with small vehicles such as motorcycles, motorbikes, snowmobiles, garden tractors, and the like. Typically, these lifts use a jack to raise a platform or arms supporting either the vehicle ground engaging portion (tires, treads, etc.) or the vehicle frame.

15 The U.S. Patent No. 4,088,303 shows a boom pivoted at one end on the upper end of a post and a hydraulic cylinder for raising and lowering the boom. A platform is attached to an opposite end of the boom for supporting a vehicle.

 The U.S. Patent No. 4,460,158 shows a lift for mopeds and motorcycles having a base, a jack for raising and lowering a frame hinged to the base and a support attached to the frame
20 for clamping the footboard of a Vespa brand moped.

 The U.S. Patent No. 4,723,756 shows a lift with four vertically telescoping legs that can be pinned in place when a jack has raised the lift to the desired height.

 The U.S. Patent No. 4,899,985 shows a low-profile hydraulic lift with a pivoted lift arm having detachable lift heads which include hooks, support yokes, chains and support harnesses.

25 The U.S. Patent No. 5,211,265 shows a scissors-type snowmobile lift with rails to contact the snowmobile bellypan.

 The U.S. Patent No. 5,271,603 shows a lifting platform connected to a base by four parallel links actuated by a hydraulic jack.

 U.S. Patent No. 6,092,787 shows a manually operated motorcycle lift with a front
30 wheel clamp and a removable extension under the unsupported rear wheel.

SUMMARY OF THE INVENTION

The present invention concerns an apparatus for lifting a small vehicle, such as a motorcycle, for various purposes such as cleaning, maintenance, repositioning from one location to another and storage. The lift apparatus includes: a ground engaging base frame
5 having a generally horizontally extending central beam with a generally vertically extending intermediate beam attached at each end thereof, each said intermediate beam having an upper end with a generally horizontally extending end beam attached thereto, a pair of spaced apart upwardly extending posts and a pair of generally horizontally extending legs, said legs each having an inner end adjacent one of said posts and an outer end, said leg inner ends being
10 spaced a first predetermined distance apart and said leg outer ends being spaced a second predetermined distance apart greater than said first predetermined distance; a pair of parallelogram linkages, each said linkage having an upper link, a lower link extending generally parallel to said upper link, an outer link, and an inner link formed by a portion of an associated one of said posts, said upper link being connected by first and second pivot means to
15 said inner and outer links respectively, said lower link being connected by third and fourth pivot means to said inner and outer links respectively; a vehicle support means attached to said outer links; and an actuator means having a lower end pivotally connected to said base frame and an upper end pivotally connected to said lower links whereby extension of said actuator means raises said vehicle support means between a lowered position for engaging and
20 disengaging from a vehicle and a fully raised position.

DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a preferred
25 embodiment when considered in the light of the accompanying drawings in which:

Fig. 1 is a front elevation view of a lift apparatus in accordance with the present invention in a storage position;

Fig. 2 is rear elevation view of the lift apparatus shown in Fig. 1;

Fig. 3 is a left side elevation view of the lift apparatus shown in Fig. 1;

Fig. 4 is a right side elevation view of the lift apparatus shown in Fig. 1 in an operating position;

Fig. 5 is a fragmentary perspective view the lift apparatus shown in Fig. 1;

Fig. 6 is a block diagram of the power unit of the lift apparatus shown in Fig. 1;

5 Fig. 7 is a side perspective view of an alternate embodiment lift apparatus in accordance with the present invention;

Fig. 8 is an enlarged fragmentary perspective view of the upper end of the actuator and load supporting means shown in Fig. 7; and

Fig. 9 is an enlarged fragmentary perspective view of the lower end of the actuator
10 shown in Fig. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figs. 1 through 5, there is shown a lift apparatus **10** designed to lift motorcycles and other small vehicles for purposes such as maintenance, repositioning and
15 storage. In Figs. 1-3, the lift apparatus **10** is shown in a folded position that is very compact for easy storage when not in use. A base frame **11** has a central beam **12** extending in a horizontal direction. Attached to opposite ends of the central beam **12** are vertically extending intermediate beams or legs **13** each having an upper end attached to an associated horizontally outwardly extending end beam or arm **14**. The beams **12**, **13** and **14** can be made from square
20 steel tubing, for example, and welded together. A free end of each of the end beams **14** is cut at an angle and closed by an attached cap or plate **15**. A caster assembly **16** is attached to and extends downwardly from the bottom surface of the free end of each of the end beams **14**. The caster assemblies **16** can be any suitable commercially available product that typically includes a rubber wheel that rotates about vertical (swivel motion) and horizontal (rolling motion) axes
25 with a foot operated brake lever **16a** for controlling the rolling motion.

Attached to a forward facing surface of each end of the central beam **12** is an inner end of each of an inner stub leg **17** and an outer stub leg **18**. The stub legs **17** and **18** extend horizontally forwardly and diverge being spaced farther apart at outer ends than at the inner ends attached to the central beam **12**. The outer legs **18** are shorter than the inner legs **17** and a
30 first bracket plate **19** is attached to an outer side wall of each of the outer legs **18** adjacent the

outer end and extends even with the outer end of the inner stub leg 17. Apertures are formed in the inner legs 17 and the first bracket plates 19 to receive a pivot means or axles 20 in the form of a bolt and nut extending horizontally transverse to a longitudinal axis of the respective outer stub leg 18. Positioned between the inner stub leg 17 and the bracket plate 19 is an inner end
5 21a of a folding leg 21 having apertures formed therein receiving the axle 20 thereby permitting the legs to be rotated between a down or operative position (Figs. 4-5) and an up or storage position (Figs. 1-3). The legs 17, 18 and 21 can be made from square steel tubing, for example, with the legs 17 and 18 welded to the central beam and the intermediate beams 13.

A stop 22, in the form of a short length of square tubing, is attached to an upper surface
10 of the outer end of the outer stub leg 18 and extends beyond that outer end. A pair of second bracket plates 23 are attached to opposite side walls of the stop 22 and extend outwardly beyond the outer end of the stop. When the folding leg 21 is rotated about the axle 20 to the up position (Figs. 1-3), the stop 22 prevents rotation beyond a generally vertical position. A fastener 24 can be inserted through apertures formed in the bracket plates 23 on the opposite
15 side of the leg 21 from the stop 22 to prevent rotation of the folding leg from the up position back to the down position. In the down position of the folding leg 21 (Fig. 5), the fastener 24 can be inserted through vertically aligned apertures formed in the stop 22 and the leg 21 to retain the folding leg in the down position. A roller assembly 25 is attached to an outer end
20 21b of the folding leg 21 at an angle to a longitudinal axis of the folding leg to compensate for the diverging angle of the folding legs. Thus, the roller assemblies 25 are aligned with the caster assemblies 16 during forward and rearward movement of the lift apparatus 10.

A support platform 26 is attached to and extends generally horizontally forward from the central beam 12. A lower end of a center post 27 is attached to an upper surface of the platform 26 and the post extends upwardly and rearwardly to an upper end to which a
25 transversely extending handle 28 is attached. A pair of support members 29 are connected between the center post 29 and the end beams 14. The handle 28 can be grasped by human hands for rolling the lift apparatus 10 on the caster assemblies 16 and roller assemblies 25 when the folding legs 21 are in the down position. When the folding legs 21 are in the up position, the handle 28 can be used to tilt the lift apparatus 10 rearwardly enough to lift the
30 folding leg ends 21a off of the ground and permit movement on the caster assemblies 16.

A portion of the center post 27 functions as an inner short link of a parallelogram linkage having an outer short link 30, a pair of upper long links 31 and a pair of lower long links 32. The links 30, 31 and 32 can be formed of square tubing. An inner end of each of the upper long links 31 is coupled on opposite sides of the center post 27 at a pivot means 33a
5 adjacent the handle 28. An outer end of each of the upper long links 31 is coupled on opposite sides of the outer short link 30 at a pivot means 33b adjacent an upper end of the short link. An inner end of each of the lower long links 32 is coupled on opposite sides of the center post 27 at a pivot means 33c spaced below the pivot means 33a. An outer end of each of the lower long links 32 is coupled on opposite sides of the outer short link 30 at a pivot means 33d
10 adjacent a lower end of the short link. The distance between the pivot means 33a and 33b is the same as the distance between the pivot means 33c and 33d, and the distance between the pivot means 33a and 33c is the same as the distance between the pivot means 33b and 33d. The pivot means 33a through 33d can be suitable fasteners such as bolts and nuts.

Attached to the lower end of the outer short link 30 is a transverse bar 34 extending
15 generally parallel to the central beam 12. Attached to and extending horizontally forward from opposite ends of the bar 34 are support bars or arms 35 upon which a motorcycle or small vehicle (not shown) can be supported. The bar 34 and the arms 35 can be formed of square tubing. A strip of padding 35a, such as a neoprene material, can be attached to the upper surface of each of the arms 35. The support arms 35 can be provided with vehicle attachment
20 means 36 such as a plurality of sliding brackets 36a each having an associated hook 36b for cooperation with straps (not shown) that can be routed over and/or through the vehicle to prevent tipping. When the lift apparatus 10 is not in use, the pivot means 33d can be removed permitting the outer short link 30 to rotate about the pivot means 33b approximately 180° to a storage position as shown in Figs. 1-3.

25 Attached to each of the lower long links 32 adjacent to the pivot means 33c is a locking plate 37 having a plurality of apertures 38 formed therein. As the lower long link 32 is rotated upwardly about the pivot means 33c, each of the apertures 38 in turn clears a front surface of the center post 27. A pin 39 can be inserted through the corresponding ones of the apertures 38 in the plates 37 to engage the central post 27 and prevent downward rotation of the link 32 with
30 a resultant lowering of the support arms 35. Thus, the apertures 38 define fixed positions of

the support arms 35 above the surface on which the lift apparatus 10 is resting. The pin 39 can be retained by a chain 40 attached to any suitable portion of the lift apparatus 10 such as the center post 27.

An actuator 41, such as a hydraulic piston and cylinder, can be used to raise and lower the support arms 35. A bottom end of a cylinder 41a is attached to the support platform 26 by a pivot means 42 for movement about an axis parallel to the rotation axes of the pivot means 33a through 33d. The actuator 41 extends between the lower long links 32 and has a piston rod 41b extending from the cylinder 41a with an upper end connected to the upper long links 31 at a pivot means 33e. Thus, extending the rod 41b from the cylinder 41a raises the support arms 35 and retracting the rod into the cylinder lowers the support arms. The actuator 41 can be manually operated through a pumping handle 43 extending therefrom whereby repeated raising and lowering of the handle forces hydraulic fluid into a cylinder chamber (not shown) against a piston (not shown) to extend the piston rod 41b. A release lever 44 is provided to vent the hydraulic fluid from the cylinder chamber thereby allowing the piston rod 41b to retract into the cylinder 41a under the weight of the supported portions of the lift apparatus 10.

The actuator 41 also can be automatically operated utilizing a power unit 45 (shown schematically in Fig. 6) including an electric motor 46 driving a hydraulic pump 47. The electric motor 46 can be an ac motor or a dc motor and is connected to a power source 48 through a start switch 49. In the case of an ac motor, the power source typically would be a building electrical circuit accessed at a wall outlet. In the case of a dc motor, the power source 48 could be a storage battery 50 mounted at the rear of the central beam 12. The power source 48 could include a converter (not shown) for changing ac power to dc power to operate the dc motor and/or charge the storage battery 50. The motor 46 and the pump 47 are mounted on an adapter 51 with the pump being enclosed in a reservoir 52 mounted on an opposite side of the adapter from the pump. The adapter 51 can be attached to one of the intermediate beams 13 and extend behind the base frame 11.

A control 53 is connected to the adapter 51 and to the start switch 49 for starting and stopping the motor 46. To start the motor 46, the control 53 is actuated to cause the start switch 49 to connect the motor to the power source 48. The motor 46 drives the pump 47 to draw hydraulic fluid from the reservoir 52 and send pressured hydraulic fluid to the adapter 51.

The adapter **51** is connected to the actuator **41** to supply the pressured hydraulic fluid causing the actuator to raise the support arms **35**. The control **53** can be actuated to stop the motor **46** and retain the actuator **41** in a desired extended position. To lower the support arms **35**, the control **53** is actuated to release hydraulic fluid from the actuator **41** to flow through the
5 adapter and back to the reservoir **52**.

The manually actuated version of the actuator **41** can be, for example, a commercially available long ram jack such as an eight-ton capacity hydraulic long hand jack with clevis item #14554 available from Northern Tool division of Northern Tool & Equipment Co. at "northerntool.com". An alternative is the eight-ton capacity long ram jack with flat base item
10 #14446 available from Northern Tool. The automatically actuated version of the actuator **41** can be a welded tee hydraulic cylinder item #908320 available from Northern Tool. The associated power unit **45** can include a Haldex Barnes Hydraulics 12 volt DC power unit item #1071 or a Haldex Barnes Hydraulics 1 HP 115/208-230 Volt AC Hydraulic Power Unit item #105881, both available from Northern Tool.

15 There is shown in Figs. 7 through 9 an alternate embodiment lift apparatus **60** designed to lift motorcycles and other small vehicles for purposes such as maintenance, repositioning, and storage. In the side view position shown in Fig. 7, the lift apparatus **60** has a forward or front load engaging portion to the right and a rearward or back operating portion to the left. A base frame **61** of the lift apparatus **60** has a supporting central beam **62** extending in a
20 horizontal direction. Attached to opposite ends of the central beam **62** are a pair of horizontally forwardly extending legs **63** each having an inner end **63a** attached to an associated end of the central beam **62** as best shown in Fig. 9. The legs **63** diverge as they extend from the central beam **62** so that outer free ends **63b** are spaced farther apart than are the inner ends **63a**. The central beam **62** and the legs **63** can be made from square steel tubing,
25 for example, and welded together. A caster assembly **64** is connected to and extends downwardly from the base frame adjacent each inner end **63a** of each of the legs **63** and a roller assembly **65** is attached to each of the outer ends **63b** of the legs **63** to engage a surface and permit movement of the lift apparatus **60** on the surface. The caster assemblies **64** can be any suitable commercially available product that typically includes a rubber wheel that rotates
30 about vertical (swivel motion) and horizontal (rolling motion) axes.

Extending upwardly from each inner end **63a** is an attached intermediate beam **66** having an upper end attached to an inner end of a horizontally extending end beam **67**. The beams **62**, **66** and **67** extend in a generally vertical plane and the caster assemblies **64** are attached to and extend downwardly from associated outer ends of the beams **67**. A vertically
5 extending support member **68** is attached to and extends upwardly from each end of the central beam **62**. A diagonal support member **69** is attached at one end to an upper end of an associated one of the support beams **68** and extends downwardly and forwardly to attach at an opposite end to the associated leg **63** between the ends thereof. Fastened to each of the support
10 members **68** is a post **70** that extends upwardly and rearwardly. Each post **70** has a handle **71** attached at an upper end and the handles **71** extend in opposite directions generally parallel to the end beams **67**.

An upper portion of each post **70** functions as an inner short link of a pair of parallelogram linkages each having an outer short link **72**, an upper long link **73** and a lower long link **74**. The posts **70** and the links **72**, **73** and **74** can be formed of square tubing. An
15 inner end of each of the upper long links **73** is pivotally coupled to the associated post **70** at a pivot means **75a** (such as an axle) generally axially aligned with the handles **71**. An outer end of each of the upper long links **73** is pivotally coupled to outer short links **72** at a pivot means **75b** (such as an axle) adjacent an upper end of the short links. An inner end of each of the lower long links **74** is pivotally coupled to the associated post **70** at a pivot means **75c** (such as
20 an axle) spaced below the pivot means **75a**. An outer end of each of the lower long links **74** is pivotally coupled to the outer short links **72** at a pivot means **75d** (such as an axle) adjacent a lower end of the short links. The distance between the pivot means **75a** and **75b** is the same as the distance between the pivot means **75c** and **75d**, and the distance between the pivot means **75a** and **75c** is the same as the distance between the pivot means **75b** and **75d**.

Attached to the lower end of each of the outer short links **72** is a generally horizontally forwardly extending support bar or arm **76** upon which a motorcycle or small vehicle (not shown) can be supported. The arms **76** can be formed of square tubing. A strip of padding **77**, such as a neoprene material, can be attached to the upper surface of each of the arms **76**. The support arms **76** can be provided with vehicle attachment means **36** shown in Fig. 4 or any
30 other suitable means.

An actuator assembly 78, including an actuator 79 such as a hydraulic piston and cylinder, can be used to raise and lower the support arms 76. The assembly 78 includes a base plate 80 attached to a bottom end of the actuator 79. Attached to a bottom surface of the plate 80 is a downwardly opening generally U-shaped bracket 81 that receives a length of rod 82
5 attached to an upper surface of the central beam 62. The bracket 81, and thus the actuator 79, are free to pivot about an axis generally parallel to the axes of the pivot means 75a through 75d. An upper end of the actuator 79 is pivotally attached to a connector beam 83 extending between and attached to the lower long links 74 forward of the pivot means 75c. Thus, as the actuator 79 is extended, the links 72 and 74 are rotated upwardly at the pivot means 75a and
10 75c respectively to raise the support arms 76. Retracting the actuator 79 lowers the support arms 76. The actuator 79 can be manually operated through a pumping handle 84 (which can be a foot operated lever) extending from the actuator whereby repeated raising and lowering of the handle forces hydraulic fluid into a cylinder chamber (not shown) against a piston (not shown) to extend the piston rod. A release lever is provided to vent the hydraulic fluid from
15 the cylinder chamber thereby allowing the piston rod to retract into the cylinder under the weight of the supported portions of the lift apparatus 60 and any load supported thereby.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and
20 described without departing from its spirit or scope.